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SNaP! Re-using, sharing and communicating designs and design knowledge using Scenarios, Narratives and Patterns

Yishay Mor, IET, the Open University, Uk. Yishay.mor@open.ac.uk

Introduction

In order to enable a culture of critical, informed and reflective design practice we need a linguistic framework for communicating *design knowledge*: the knowledge of the characteristic features of a domain of practice, the challenges which inhabit it, and the established methods of resolving them. Such an infrastructure must “serve two masters”; on one hand, it should adhere to the requirements of scientific rigor, ensuring that the proposed conditions and challenges are genuine and the solutions effective. On the other hand, it should maintain pragmatic adequacy, ensuring that the insights it encapsulates are readily available for practitioners to implement in real-world situations. Several representations have been proposed to this effect: design narratives (Mor, 2011; Barab et al, 2008; Bell, Hoadley and Linn, 2004; Hoadley, 2002; Linn & Hsi, 2000), design principles (Kali, 2006, 2008; Linn, Bell, & Davis, 2004; Merrill, 2002; Quintana et al., 2004; van den Akker, 1999), and design patterns (Derntl & Motschnig-Pitrik, 2005; Goodyear, 2005; Mor & Winters, 2007; Retalis et al, 2006), to name a few. The aim of this chapter is to characterise two of these forms – design narratives and design patterns, and propose a third form – design scenarios, and suggest how these could be embedded in a cycle of reflective learning design.

The combination of design narratives, design patterns and design scenarios is best suited for the social construction of design knowledge in and around the cycle of a design experiment. While the notion of design experiment is derived from the tradition of design based research in education, it is well suited as a framework for any innovation process, so long as this process is rigorous and reflexive. The cycle of a design experiment (

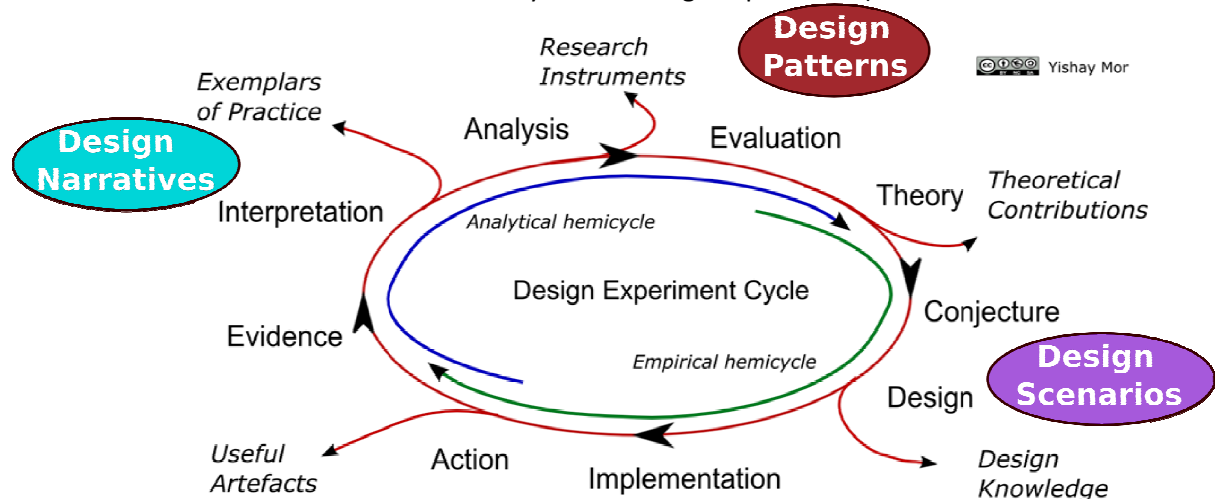


Figure 1) iterates through theory, design, implementation, enactment, interpretation and evaluation. Design scenarios offer a viable and reliable form for deriving design postulates from theory, design narratives provide a rich form for interpreting the evidence emerging from the implementation and enactment of such postulates, and design patterns allow the robust and flexible organisation of transferable design knowledge derived by analysis and evaluation of design narratives. Together, these representations bridge the gap between theory and practice, mutually informing and directing one another.

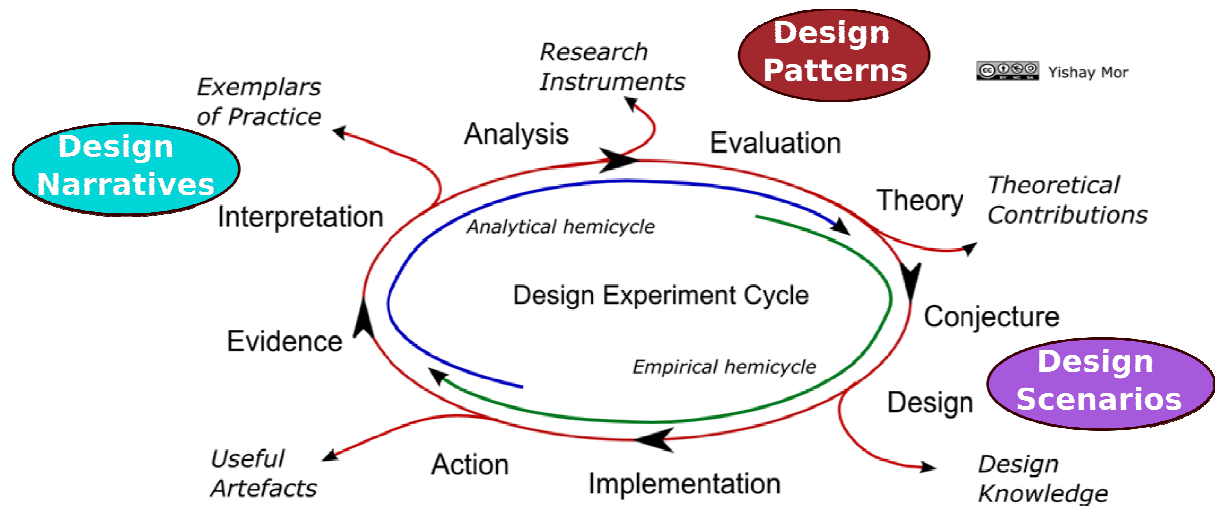


Figure 1: the design experiment cycle, with embedded representations

Design Narratives: a base form for capturing design knowledge

Design narratives are accounts of critical events from a personal, phenomenological perspective. They focus on design in the sense of problem solving, describing a problem in the chosen domain, the actions taken to resolve it and their unfolding effects. They provide an account of the history and evolution of a design over time, including the research context, the tools and activities designed, and the results of users' interactions with these. They portray the complete path leading to an educational innovation, not just its final form – including failed attempts and the modifications they espoused.

In order for design narratives to provide an effective form of design discourse in education, they need to be shaped in a way that adheres to scientific standards, acknowledges the pragmatic agenda of education, and retains the essential qualities of narrative. A scientific standard demands a transparent audit trail from reliable data to conclusions, and a clear articulation of refutable claims. Where subjectivity is inevitable, it should be reported honestly. A pragmatic stance dictates a functional focus linked to a value dimension, attention to context and representation, and an awareness of the complexity of human situations. Narrative form entails a clear context description, a protagonist, a plot – a temporally and semantically linked sequence of events – and an implied moral. A design narrative presents a single perspective on a single problem to be solved or task to be accomplished. Thus, there can be multiple narratives of the same experiment. All are just as valid, as long as they meet the criteria.

A design narrative should:

- Provide an account of an aspect of a design experience, from the perspective of the designer or that of a participant, and, as much as possible, capturing their voice.
- Clearly delineate the context of the design experiment and its educational goals, noting the material, social and intentional factors that define the problem space.
- Identify a design challenge within this context; a declaration of the change which the designer wishes to affect.
- Specify a theoretical framework which defines the process by which the designer approaches the challenge and the methods by which she evaluates the outcomes.

I distinguish between two types of design narratives: designer narratives (DNs) and participant narratives (PNs).

DNs recount a pedagogical problem and its resolution from the designer's point of view. The designer in this case could be an educational practitioner or researcher, devising a learning experience, or the developer of educational tools or content. DNs are first person accounts of the designer's experience and observations, in the course of a design experiment. In most cases, the focus is on the design and development of activities, social practices and supporting technology. These elements are seen as an integral unit, under the socio-technical stance that these are inseparable and any partial description would lead to unsubstantiated conclusions.

PNs follow the participants in a design experiment – teachers and learners – as designers, contending with problems they encountered in the context of an activity, their use of the resources provided in confronting this problem, and the indications of their learning gains in the process. These are third person accounts based on the participants' written and verbal articulations and the designer's observations.

These two types of narratives are interdependent; the problems encountered by learners and their resolution are the drivers of their learning trajectory. The designer's problem, from a bird's eye view, is to provide learners with an effective set of problems and the means for resolving them, so as to direct their learning trajectory. Thus, the PNs illuminate and substantiate the RNs.

The following example design narrative is drawn from the FEASST project (<http://feasst.wordpress.com/>).

CoMo: mobiles + flickr = co-reflective practice

At the Royal Veterinary College, a group of students were engaged in practical work in a vet training hospital. As part of their training, the students were required to capture instances of practice on a mobile phone and the photos collected were automatically uploaded to flickr. The students worked in groups of 4 or 5 and each was provided with a mobile phone and given a short familiarisation session. In one scenario, during morning rounds students would be directed to monitor the progress of an animal being treated. Their task would be to document case progress over time. They took pictures throughout the day, uploaded them to a blog, tagged them with caseID and key features e.g. type of animal, the injury, condition. The students then used quiet moments to add details to the 'case' using blog postings. During the evening rounds, the students presented their cases in group discussion sessions with their tutor, using the images, blog posts and a projector. The group reviewed the diagnosis and the actions which were taken, and reviewed these in the light of revisiting the images and postings which acted as catalysts for evaluation of practice. Co-reflection was enhanced because of the availability of images which bring the medical case into the seminar room. It affected the students' tutorial conversation, providing ongoing formative contributions to the case in the form of postings. The discussion moved from abstract "textbook theory" to what tutors called "case presentation": how the particular condition presents itself in a particular case, how to analyse symptoms in real-world conditions and how to assess treatment. These are key skills which are often neglected due to the inability to have a concrete presence of the case in the seminar room as a focus for reflective and analytical discussion. The process of using images to capture cases also provided feedback to tutors on the students' learning. Tutors reported that observing students' pictures gave them a window on their thinking: what they noticed, where their attention was and where they assigned importance. This was the basis for modifying tutor input and the focus of the tutorial discussion.

Design Patterns: situated abstractions of design narratives

The *Design patterns* paradigm (Alexander et al, 1977) was developed as a form of design language within architecture. The core of a design pattern can be seen as a local functional statement: “for problem P, under circumstances C, solution S has been known to work”. Such a structure reads like a direct generalisation of the design narrative form.

In order to include design patterns as elements of a scientific discourse, a clear path needs to be marked from narratives to patterns, and mechanisms established for validating them. Mor (2010) defined the following process:

1. A prominent design feature is identified in a design narrative, by linking it to a pedagogically effective outcome, or to the resolution of a critical problem.
2. The design feature is captured using a core template of *Problem*, *Context*, and *Solution*. The source design narrative is noted.
3. Other narratives are searched for additional support.
4. The problem is expressed as a configuration of forces.
5. The initial context of the pattern is defined by the situational characteristics common to all supporting narratives.
6. The solution is articulated in the most specific detail that was still consistent with all supporting cases.

The identification and articulation of the initial set of patterns is typically followed by a phase of organising and refactoring the pattern language as a whole. The links between patterns are identified and noted, and new patterns are derived by structural manipulations, such as:

- *Specification*: when a pattern’s empirical support is found to be weak, the pattern’s scope is narrowed down to fit the evidence.
- *Decomposition*: where peer review indicates that patterns were too complex or too sensitive to contextual factors they are broken into several more robust components, each expressed as a separate pattern.
- *Extraction*: design features that recur in several patterns are expressed as a new pattern and noted as a component in the others.
- *Generalisation*: where the distinction between two patterns is unclear, they are merged and expressed as a pattern of a higher level of abstraction, and the source patterns noted as its extensions.

This process may be iterated until it produces a stable collection of linked patterns. Patterns which lack sufficient empirical support, or are poorly connected to the collection, should be removed from the collection but saved for future consideration. The guiding objective is to collate a coherent set of patterns, offering a solid base for a potential language of patterns. The patterns which are produced by this process should then be substantiated further by eliciting empirical and theoretical support from the relevant scientific and professional literature. Finally, visual aids such as metaphoric illustrations and structural diagrams are added to enhance the patterns’ text. The same collection of design narratives could, theoretically, give rise to different sets of design patterns, reflecting the authors’ choice of interpretative framework and her focal domain of practice. The process of

developing design patterns is accompanied and guided by constant monitoring of their quality along two dimensions: the scientific validity of the claims they encapsulate, and their ability to communicate these claims.

Every pattern language and collection defines a common template for all the patterns it includes. Such a template is useful for users of the collection, as it enables them to search and apply patterns as needed. At the same time, a carefully designed template safeguards rigour by prompting the pattern author to address all the important aspects of the patterns. An Exemplar template can be found at: <http://goo.gl/eyZQU>.

As an example, The FEASST project report included eleven patterns derived from the narratives collected by the project. The Classroom Display pattern was derived from the CoMo narrative provided earlier:

Classroom display

<http://patternlanguagenetwork.myxwiki.org/xwiki/bin/view/Patterns/Classroomdisplay>

Summary

Share your work with a trusted audience.

Problem

Using learners' work as part of the instructional activity has several advantages, it:

- Rewards participation.
- Makes learning more meaningful, by relating it to learner's personal experiences.
- Allows the teacher to align instruction with students' perspective and current state of knowledge.

However, doing this poses some challenges:

- The teacher needs to have learners' works collated in a single easy to access location, so that she can draw on them as needed.
- Learners may feel uncomfortable about presenting their work in a public space.
- There may be legal or other restrictions on sharing work.

Context

Most suited for small to medium size classes, blended learning, not one-off, where learning has an element of production / construction of visual artefacts. However, could be adapted and extended to a very wide range of settings.

Solution

Create a space within the learning environment where learners' works can be displayed side by side.

Works can be arranged thematically, chronologically, as an index or as a *Visual Narrative*.

The size and location of the display should allow learners and teacher to view a collection of learners' work simultaneously, and refer to them in the course of the learning activity.

The display should be visible for all learners, but may need to be concealed from the outer world. If not, it should at least function as a *Front Garden*.

Design Scenarios: framing refutable design claims

Design narratives represent design knowledge extracted from empirical evidence, capturing and interpreting the designers' experience. Design patterns attempt to organize this knowledge into complex modular structures. Design scenarios borrow the form of design narratives, adapting it from an account of documented past events to a description of imagined future ones. Scenarios function both as a scientific form and as a practical tool. From a scientific viewpoint, they offer a means for

validating the design claims emerging from design narratives and encapsulated in design patterns, by formulating refutable predictions; if a narrative reports “this worked”, a pattern argues “under such conditions this may work”, a scenario claims “if we do this, it will work”. From a practical stance, scenarios are a powerful tool in the hands of the designer. They allow her to articulate a thick description of a design challenge in a realistic context, and harness existing design knowledge and theoretical frameworks to propose a viable solution to this challenge. At the heart of a design scenario are a sequence of actions the protagonists may take to achieve their objectives, events they may encounter and their reactions to these, and finally – the ensuing results of this sequence. These actions, events, and consequent results are afforded or driven by the qualities of new artefacts introduced into the context. Thus, they express a design claim: that introducing such artefacts into such a context may induce such results. However, this claim is stated in a thickly grounded form, submitting it to elaborate scrutiny.

Design scenarios retain the same basic components that constitute design narratives: context, challenge, theoretical framework, events and actions, results and reflections. However, these elements reflect a hypothesis about possible future states of the world. The context describes a current, existing situation, which is perturbed by the introduction of new material, social and intentional elements such as new technologies, new practices, or new objectives. Consequently, the challenge component may describe an existing conflict of forces, which is altered by the introduction of new contextual elements. Alternatively, it may consist of altogether new requirements arising from the reconfiguration of forces, such as the satisfaction of novel objectives. The protagonists in a design scenario do not need to refer to specific individuals in the real world, but they must describe persons who could, convincingly be present in the domain of practice being explored and be ascribed with the intentions and social relations included in the described context. Such constructs are often denoted Persona in HCI methodology – fictitious characters representing a typical person within the domain.

Ethnographic methods are used to construct an elaborate description of the context. This can include appropriate visual materials, such as photographs, videos and sketches. The contextual elements can be organized into a force map, as described earlier.

The proposed solution may be articulated as a story-board: a series of sketches or diagrams depicting the protagonists’ actions and their expected outcomes (Figure 3). In the case of technological innovation, a storyboard might include wireframe diagrams of the user interface. In case of innovation in pedagogical practice, it may include comic-style sketches of learners and teachers activities. Storyboards are very powerful in facilitating discussions with possible stakeholders.

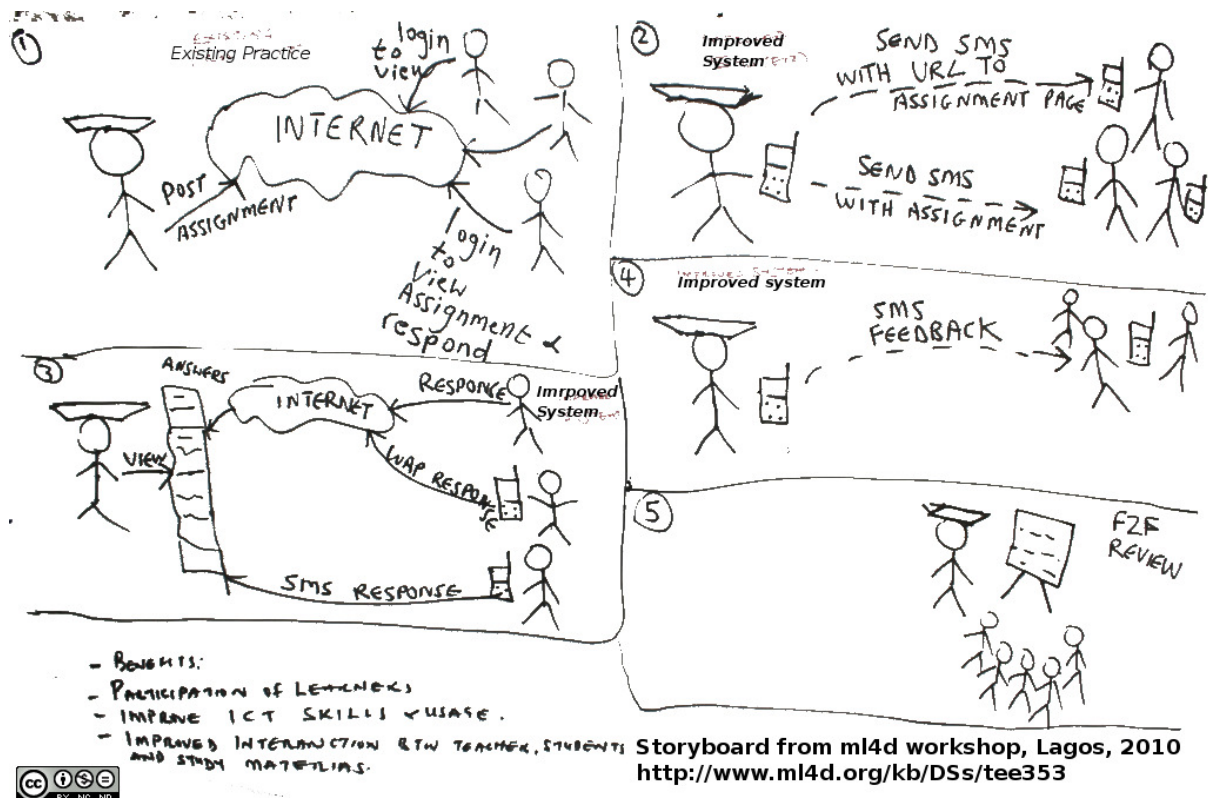


Figure 3: example storyboard, from the ML4D project (<http://www.ml4d.org/kb/DSs/tee353>), describing a proposed innovation using mobile phones to enhance existing methods of managing assignments

The claim embodied in a design scenario can be judged theoretically, heuristically and empirically. Theoretical assessment would evaluate the statements in the scenario by comparing them to prior knowledge. For example, if the scenario includes an event to which a protagonist responds in a particular way, we can ask if this response is consistent with evidence of human behaviour in similar situations. Heuristic evaluation is a technique borrowed from usability research, where a group of experts is asked to assess a particular design using a given rubric (set of heuristics). It offers a low-fidelity rapid evaluation which often uncovers design flaws at an early stage. Finally, empirical evaluation consists of implementing the proposed design, introducing the new artefacts into the domain of practice, observing real participants' reactions to them and comparing their actions (and their results) to the ones in the scenario.

Whether they are used as a stage in an actual design and development process, or as a conceptual representation of possible innovations for the sake of discussion, scenarios are a powerful tool in making ideas explicit and grounding them in realistic contexts.

As an example, the FEASST project facilitated a workshop in which software developers reviewed the narratives and patterns collected from practitioners, and used them to develop scenarios of technological innovations. One of these scenarios is included in the project report:

Situation

First year undergraduate students starting a new subject in large classes (around 600) supported by small tutorial groups (6-12 students), taught on campus and with access to a VLE.

Task

A number of such courses require that students learn large new vocabularies quite quickly. Two contrasting examples would be biology where students are expected to master a large number of unfamiliar terms, and philosophy where students are expected to master the specific technical meanings of perhaps well-known words and phrases. Formative assessment has potentially an important role in the learning of these vocabularies.

Solution

Students would build up their own personal glossaries, individually typing in the words and their own definitions, illustrating use in context, and then come together to share these definitions. This is an application of the NARRATIVE SPACES pattern giving learners opportunities to express themselves in narrative form, supporting the use of the vocabularies in context, and then bringing them together into groups where again the discussion and comparison of the definitions practices the use of the language of the domain. In the case of biology the incorporation of images would also be important.

Using the pattern *Objects to Talk With* the vocabularies and definitions are made into objects to talk with through being externalized, resulting in the sharing of individual definitions in groups, with peer assessment, commentary on other definitions and voting for the best definitions.

The pattern *Classroom Display* can be used as these meanings become more stabilized enabling the sharing of personal understandings of vocabularies with a trusted audience.

The *Showcase Learning* pattern becomes applicable as these definitions are refined, moving up from small groups to tutorial groups and finally to the whole class with a process of voting and selecting the best at each stage, enabling the public celebration of the students' work.

STRENGTHS AND CAVEATS

Design Patterns and Principles have been demonstrated as powerful mediators between theory and practice yet their abstract nature hinders widespread adoption by the practitioner community. Design Narratives have the potential of addressing this challenge by grounding design claims in concrete experiences, and Scenarios afford the formulation of refutable design claims. Design patterns, narratives and scenarios are derived from practical experience. As such, they are firmly grounded in reality, but often lack scientific rigor. It is important to ensure that the strong pragmatic intuitions are linked to hard evidence through appropriate theoretical frameworks.

Despite the prevalence of the narrative form in reports of design research (Bannan-Ritland, 2003) it raises several methodological and practical issues. In the words of Shavelson et al. (2003:25), "there is nothing in narrative form that guarantees veracity". Practically, narrative accounts do not fit well into academic publication format (Reeves et al, 2005). One apparent source of methodological vagueness is the lack of upfront discussion of the narrative tools used by researchers. With a few notable exceptions (e.g. Barab et al, 2008) most studies intuitively use a narrative style of report without explicitly formulating it as a methodology. Even when the form is discussed, it lacks a rigorous definition: what is the core structure of a design narrative? How are its boundaries set? How are events selected and details filtered out? How should we judge if the narrative warrants the researchers' claims?

Another source of difficulty lies within the inherent nature of narrative. In a well-crafted narrative, the message of the story is left implicit (Mor & Noss, 2008). This feature may be epistemically powerful, as it provokes the reader to infer the message and construct her own logical structure to support it. However it is incompatible with scientific discourse, which demands that the path from evidence to arguments to conclusions be exposed to peer scrutiny. The implication is that design

narratives are incomplete as a scientific form, and need to be accompanied by a representation of the derived knowledge.

Finally, it is important to remember the interpretive quality of narrative. A narrative is not a neutral recount of events; it is the outcome of the narrator's immediate attempt at making sense of events, a conjecture regarding the semantics of occurrences. Arguably, this is common to all manner of organising evidence: the statistical analysis of a randomised experiment reflects the researchers' choice of parameters and variables. Yet in the case of statistical analysis, another researcher using the same choice of material could have produced the same result. A narrative is unique to its narrator. This subjectivity may be appropriate in design research, where the researcher is part of the phenomena, but nevertheless needs to be accounted for.

CONCLUSION

This chapter outlined a framework for constructing and sharing design knowledge using design narratives, patterns and scenarios. This framework harnesses the epistemic and expressive power of narrative form, and combines it with the modularity, abstraction and succinctness of design patterns. Scenarios, narratives and patterns have been used successfully, in various combinations, as a framework for design research in educational technology, a methodology for practitioner's collaborative reflection, and as a pedagogy for training educational practitioners. Readers interested in finding out more are invited to follow the links below.

The Learning Design Grid lists a variety of representations, tools and methodologies, including patterns, narratives and scenarios, and links to several associated projects: <http://www.ld-grid.org>.

The Learning Patterns project produced around 25 design narratives and 150 patterns, 50 of them at a beta or release level of maturity: <http://lp.noe-kaleidoscope.org/>.

The pattern language network site lists over a hundred design narratives, close to 30 design patterns and 13 scenarios: <http://patternlanguagenetwork.myxwiki.org>.

The JISC funded FEASST project produced 9 design narratives, 10 patterns and 2 scenarios in the domain of formative e-assessment: <http://feasst.wordpress.com/>.

Recently, the methodology has been used, with promising initial results, by the ML4D project in the domain of mobile learning for development: <http://www.ml4d.org/>.

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